

What is claimed is:

1. A pneumatic tire having a tread defining an inner shoulder, an outer shoulder and a tread pattern therebetween, the tread pattern comprising an inner circumferential groove, an outer circumferential groove and at least one intermediate circumferential groove therebetween, the circumferential grooves dividing the tread into four or five circumferential ribs including inner and outer shoulder ribs, inner and outer intermediate ribs between the shoulder ribs and an optional central rib between the intermediate ribs,

the inner shoulder rib having a first set of lateral grooves extending from the inner shoulder toward but not reaching the inner circumferential groove, the inner shoulder rib having multiple sipes which are arranged between adjacent pairs of lateral grooves,

the outer shoulder rib having a second set of lateral grooves extending from the outer shoulder toward but not reaching the outer circumferential groove, the outer shoulder rib also having multiple sipes which are arranged between adjacent pairs of lateral grooves,

wherein the width of at least one shoulder rib is between about 17% and about 19% of the width of the tread, and further

wherein the tread defines a void volume and a land-sea surface area, the land-sea surface area being about 4-8% larger than the void volume.

2. The pneumatic tire according to claim 1, wherein the tire includes five circumferential ribs.

3. The pneumatic tire according to claim 1, wherein the tread defines a void volume of about  $26.3\% \pm 1.0\%$ .

4. The pneumatic tire according to claim 3, wherein the tread defines a void volume of about  $26.3\% \pm 0.5\%$ .

5. The pneumatic tire according to claim 3, wherein the land-sea surface area ratio of the tread pattern is about  $32.0\% \pm 1.0\%$ .

6. The pneumatic tire according to claim 5, wherein the land-sea surface area ratio of the tread pattern is about 32.0%  $\pm$ 0.5%.

7. The pneumatic tire according to claim 1, wherein the land-sea surface area ratio of the tread pattern is about 32.0%  $\pm$ 1.0%.

8. The pneumatic tire according to claim 1, wherein the land-sea surface area ratio of the tread pattern is about 32.0%  $\pm$ 0.5%.

9. The pneumatic tire according to claim 1, wherein the sipes in the inner and outer shoulder ribs extend to the inner and outer circumferential grooves, respectively.

10. The pneumatic tire according to claim 1, wherein the width of at least one shoulder rib is between about 17.5% and about 18.5% of the width of the tread.

11. The pneumatic tire according to claim 1, wherein the depth of the lateral grooves in the intermediate ribs and the central rib, if present, is at least one-half of the non-skid depth of the tread.

12. The pneumatic tire according to claim 11, wherein the depth of the lateral grooves in the shoulder ribs is the same as the non-skid depth of the tread.

13. The pneumatic tire according to claim 1, wherein the depth of the lateral grooves in the intermediate ribs and the central rib, if present, extends to or below the tread wear indicator height of the tread.

14. The pneumatic tire according to claim 13, wherein the depth of the lateral grooves in the shoulder ribs is the same as the non-skid depth of the tread.

15. The pneumatic tire according to claim 1, wherein the depth of the lateral grooves in the intermediate ribs and the central rib, if present, is the same as the non-skid depth of the tread.

16. The pneumatic tire according to claim 15, wherein the depth of the lateral grooves in the shoulder ribs is the same as the non-skid depth of the tread.

17. The pneumatic tire according to claim 1, wherein two sipes are positioned between each adjacent pair of lateral grooves in the two shoulder ribs such that, for each pair, the distance between one lateral groove and the adjacent sipe versus the distance between the two sipes versus the distance between the other sipe and the other lateral groove are in a ratio between 25/50/25 and 35/30/35.

18. The pneumatic tire according to claim 17, wherein this ratio is ~30/~40/~30.

19. The pneumatic tire according to claim 1, wherein the optional central and two intermediate ribs each define lateral grooves extending from the circumferential groove on one side of the rib toward but not reaching the circumferential groove on the other side of that rib, with adjacent pairs of these lateral grooves having at least one sipe positioned therebetween.

20. The pneumatic tire according to claim 19, wherein the lateral grooves and adjacent sipes in the two intermediate ribs define a series of U-shaped rib sections.

21. The pneumatic tire according to claim 20, wherein adjacent U-shaped rib sections in each rib face in opposite directions.

22. The pneumatic tire according to claim 21, wherein two sipes are arranged between adjacent pairs of lateral grooves in the two intermediate ribs such that I-shaped rib sections are defined by these sipes between adjacent U-shaped rib sections.

23. The pneumatic tire according to claim 19, wherein at least some of the lateral grooves and sipes in the optional central and two intermediate ribs are arranged at an acute angle with respect to the circumferential grooves.

24. The pneumatic tire according to claim 23, wherein at least some of the sipes in the central and two intermediate ribs are curved.

25. The pneumatic tire according to claim 24, wherein the curved sipes have a radius of curvature of about 40 mm to about 120 mm.

26. The pneumatic tire according to claim 24, wherein two sipes are arranged between adjacent pairs of lateral grooves in the optional central and two intermediate ribs such that I-shaped rib sections are defined by these sipes.

27. The pneumatic tire according to claim 26, wherein the tire includes a central rib, and further wherein adjacent sipes in the central rib curve in opposite directions such that some of the I-shaped rib sections in the central rib are larger at their centers than at their tops and bottoms while other I-shaped rib sections are smaller at their centers than at their tops and bottoms.

28. The pneumatic tire according to claim 27, wherein I-shaped rib sections with larger centers alternate with I-shaped rib sections with smaller centers around the circumference of the tire.

29. The pneumatic tire according to claim 26, wherein the sipes defining the I-shaped rib sections in each rib extend between the circumferential grooves on opposite sides of that rib.

30. The pneumatic tire according to claim 24, wherein the curved sipes in the two intermediate ribs define two ends, one of these ends intersecting a circumferential groove at an angle  $\alpha$  of about 40-50° and the other of these ends intersecting a circumferential groove at an angle  $\beta$  of about 20-30°.

31. The pneumatic tire according to claim 19, wherein two essentially-parallel curved sipes are arranged between adjacent pairs of lateral grooves in the two intermediate ribs such that I-shaped rib sections are defined by these sipes between adjacent U-shaped rib sections, these lateral grooves and sipes being arranged at an acute angle with respect to the circumferential curves.

32. The pneumatic tire according to claim 1, wherein the tire has an outside diameter of 690 mm or more and further wherein the lateral grooves, sipes and tread sections defining the tread pattern are arranged in 66-70 repeating pitches having at least three different circumferential lengths for reducing rolling noise of the tire.

33. The pneumatic tire according to claim 1, wherein the tire has an outside diameter of 620-690 mm and further wherein the lateral grooves, sipes and tread sections defining the tread pattern are arranged in 66 repeating pitches having at least three different circumferential lengths for reducing rolling noise of the tire.